REMARKS

Rejection Under 35 U.S.C. § 103(a) over Bonk in View of Mueller et al.

Claims 1, 4-28, and 30-54 have been rejected as unpatentable over Bonk et al., U.S. Patent 6,082,025 in view of Mueller et al., U.S. Patent 6,403,231. Applicants respectfully traverse the rejection.

Each of the claims has as a feature a microlayer polymeric composite layer comprising alternating elastomeric and polymeric barrier material layers, with the polymeric barrier material comprising a laminar nano-filler. The Office Action argues that one would combine the laminar montmorillonite nanofiller of Mueller into Bonk because Mueller teaches in column 6 that its films are flexible. However, because Mueller does not teach that its films are *resilient*, a property different from flexibility, and because Mueller teaches that incorporating nanofiller is expected to increase stiffness and other such mechanical properties.

The Office Action relies Mueller column 6, lines 41-54 for teaching that the Mueller laminate films are flexible, drawing from this statement two unsupported conclusions: (1) that if the film is flexible, it must be resilient and (2) that is the film is flexible then incorporating the nanofiller has not altered its "resiliency" vis-à-vis an unfilled film.

First, "resilience" refers to the "ability to regain an original shape quickly after being strained or distorted." *Engineering Materials Handbook: Volume 1, Composites,* at page 20 (ASM International Handbook Committee, Theodore J. Reinhard, Technical Chairman 1987). Applicant's "resilience" must be interpreted in this way. See Specification, paragraph 3, last sentence ("It would be preferred from the standpoint of maintaining membrane resiliency to reduce gas transmission rate by a method that does not substantially increase the stiffness of the membrane."); paragraph 8, third sentence ("The elastomeric material provides resiliency and

dimensional stability to the membrane of the invention, while the polymeric fluid barrier material allows the membrane to prevent the transfer of a fluid from one side of the membrane to the other."). The Mueller sheets do not include any elastomeric materials and are not resilient. The Mueller sheet is flexible, but so is a piece of paper: If you hold a sheet of paper by two adjacent corners, it will flex and bend over. But paper is in no way "resilient;" it cannot be regain its original shape if distorted under a strain; it does not even distort, but rather tears. Similarly, though the Mueller sheets may be thin enough to be flexible, they have no resilience.

Applicant explains in the Background and Summary sections of this application that, while better barrier properties are desirable for membranes used in making inflated bladders, it is likewise desirable to maintain the resilience of such membranes. Specification, paragraph 3, last sentence ("It would be preferred from the standpoint of maintaining membrane resiliency to reduce gas transmission rate by a method that does not substantially increase the stiffness of the membrane."); paragraph 6, last line ("The Tokoh et al. materials [laminates of filled EVOH and polyolefin] do not have the resiliency required for cushioning devices and many inflated articles."); paragraph 8, third sentence ("The elastomeric material provides resiliency and dimensional stability to the membrane of the invention, while the polymeric fluid barrier material allows the membrane to prevent the transfer of a fluid from one side of the membrane to the other.").

The Mueller patent, on the other hand, teaches away from maintaining the resilience of a membrane by teaching the stiffness of its laminate sheet is increased with the added filler. See col. 6, lines 33-40; Example 18, columns 13-14. This result is the same undesirable outcome one of art faced regarding improving barrier properties in a resilient membrane for inflated bladders,

as discussed in Applicant's Background. The Mueller patent thus teaches away from the membrane Applicant claims in which there is no appreciable decrease in membrane resilience.

Therefore, one could not have expected the improvement in including the nano-filler in microlayers of a microlayer polymeric composite layer of a membrane, as it would not have been apparent from the Mueller films. It is, really, only hindsight that guides this combination.

Accordingly, Applicants request that the rejection be withdrawn and the claims be reconsidered.

CONCLUSION

Applicants believe that the claims are in condition for allowance, and an early allowance of the application is earnestly requested.

The Examiner is invited to telephone the undersigned if it would be helpful for resolving any issue.

Respectfully submitted,

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resin impregnation bath and through a shaping die, where the resin is subsequently cured.

pyrolysis. With respect to fibers, the thermal process by which organic precursor fiber materials, such as rayon, polyacrylonitrile (PAN), and pitch, are chemically changed into carbon fiber by the action of heat in an inert atmosphere. Pyrolysis temperatures can range from 800 to 2800 °C (1470 to 5070 °F), depending on the precursor. Higher processing graphitization temperatures of 1900 to 3000 °C (3450 to 5430 °F) generally lead to higher modulus carbon fibers, usually referred to as graphite fibers. During the pyrolysis process, molecules containing oxygen, hydrogen, and nitrogen are driven from the precursor fiber, leaving continuous chains of carbon.

Q

quasi-isotropic laminate. A laminate approximating isotropy by orientation of plies in several or more directions.

R

random pattern. A winding with no fixed pattern. If a large number of circuits is required for the pattern to repeat, a random pattern is approached. A winding in which the filaments do not lie in an even pattern.

reaction injection molding (RIM). A process for molding polyurethane, epoxy, and other liquid chemical systems. Mixing of two to four components in the proper chemical ratio is accomplished by a high-pressure impingement-type mixing head, from which the mixed material is delivered into the mold at low pressure, where it reacts (cures).

reinforced plastics. Molded, formed, filament-wound, tape-wrapped, or shaped plastic parts consisting of resins to which reinforcing fibers, mats, fabrics, and so forth, have been added before the forming operation to provide some strength properties greatly superior to those of the base resin.

reinforced reaction injection molding (RRIM). A reaction injection molding with a reinforcement added. See also *reaction injection molding*.

reinforcement. A strong material bonded into a matrix to improve its mechanical properties. Reinforcements are usually long fibers, chopped fibers, whiskers, particulates, and so forth. The term should not be used synonymously with filler.

relaxation time. The time required for a stress

mold release agent. Also called parting agent.

release film. An impermeable layer of film that does not bond to the resin being cured. See also *separator*.

residual gas analysis (RGA). The study of residual gases in vacuum systems using mass spectometry.

residual strain. The strain associated with residual stress.

residual stress. The stress existing in a body at rest, in equilibrium, at uniform temperature, and not subjected to external forces. Often caused by the forming and curing process.

resilience. The ratio of energy returned, on recovery from deformation, to the work input required to produce the deformation (usually expressed as a percentage). The ability to regain an original shape quickly after being strained or distorted.

resin. A solid or pseudosolid organic material, usually of high molecular weight, that exhibits a tendency to flow when subjected to stress. It usually has a softening or melting range, and fractures conchoidally. Most resins are polymers. In reinforced plastics, the material used to bind together the reinforcement material; the matrix. See also *polymer*.

resin content. The amount of resin in a laminate expressed as either a percentage of total weight or total volume.

resin pocket. An apparent accumulation of excess resin in a small, localized section visible on cut edges of molded surfaces, or internal to the structure and nonvisible. See also *resin-rich area*.

resin-rich area. Localized area filled with resin and lacking reinforcing material. See also *resin pocket*.

resin-starved area. Localized area of insufficient resin, usually identified by low gloss, dry spots, or fiber showing on the surface.

resin system. A mixture of resin and ingredients such as catalyst, initiator, diluents, and so forth, required for the intended processing and final product.

resin transfer molding (RTM). A process whereby catalyzed resin is transferred or injected into an enclosed mold in which the fiberglass reinforcement has been placed.

resistivity. The ability of a material to resist passage of electrical current either through its bulk or on a surface.

reverse impact test. A test in which one side of a sheet of material is struck by a pendulum or falling object, and the reverse side is inspected for damage.

RGA. See *residual gas analysis*.

rheology. The study of the flow of materials, particularly plastic flow of solids and the flow of non-Newtonian liquids. The science treating the deformation and flow of matter.

rib. A reinforcing member designed into a plastic part to provide lateral, horizontal, hoop, or other structural support.

RIM. See *reaction injection molding*.

rise time. In urethane foam molding, the time between the pouring of the urethane mix and the completion of foaming.

Rockwell hardness. A value derived from the increase in depth of an impression as the load on an indenter is increased from a fixed minimum value to a higher value and then returned to the minimum value. Indenters for the Rockwell test include steel balls of several specific diameters and a diamond cone penetrator having an included angle of 120° with a spherical tip having a radius of 0.2 mm (0.0070 in.). Rockwell hardness numbers are always quoted with a prefix representing the Rockwell scale corresponding to a given combination of load and indenter, for example, HRC 30.

room-temperature curing adhesive. An adhesive that sets (to handling strength) within an hour at temperatures from 20 to 30 °C (68 to 86 °F) and later reaches full strength without heating.

room-temperature vulcanizing (RTV). Vulcanization or curing at room temperature by chemical reaction; usually applies to silicones and other rubbers.

roving. A number of yarns, strands, tows, or ends collected into a parallel bundle with little or no twist.

roving ball. The supply package offered to the winder, consisting of a number of ends or strands wound to a given outside diameter onto a length of cardboard tube. Usually designated by either fiber weight or length in yards.

roving cloth. A textile fabric, coarse in nature, woven from rovings.

RRIM. See *reinforced reaction injection molding*.

RTM. See *resin transfer molding*.

RTV. See *room-temperature vulcanizing*.

S

sandwich constructions. Panels compo lightweight core material, such as comb, foamed plastic, and so forth, to two relatively thin, dense, high-stre high-stiffness faces or skins are adhe

satin. A type of finish having a satin or appearance, specified for plastics or c ites.

satin weave. See *harness satin*.

S-basis. The S-basis property allowabl minimum value specified by the app federal, military, Society of Automo gineers, American Society for Test Materials, or other recognized and a specifications for the material.

SBS. See *short beam shear*.

scarf joint. A joint made by cuttin similar angular segments on two ad and bonding the adherends with the c fitted together. See also *lap joint*.

scrim. A low-cost reinforcing fabric ma continuous filament yarn in an op construction. Used in the processing or other B-stage material to facilit dling. Also used as a carrier of adh be used in secondary bonding.

sealant. A material applied to a joint in liquid form that hardens or cures i forming a seal against gas or liquid

secant modulus. Idealized Young's derived from a secant drawn betv origin and any point on a nonlinea strain curve. On materials whose changes with stress, the secant mo the average of the zero applied str and the maximum stress point being ered. See also *tangent modulus*.

secondary bonding. The joining toge the process of adhesive bonding, o more already cured composite parts which the only chemical or thermal occurring is the curing of the adhesi

secondary structure. In aircraft and a applications, a structure that is not c flight safety.

self-extinguishing resin. A resin for that will burn in the presence of a f will extinguish itself within a speci after the flame is removed.

self-skinning foam. A urethane foam duces a tough outer surface over a f upon curing.